Internal Revenue Service

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HiiROC USA
c/o Kilpatrick Townsend & Stockton LLP
Two Embarcadero Center
Suite 1900
San Francisco, CA 94111

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To whom it may concern:

HiiROC response to:
Proposed regulations relating to Sections 45V and Section 48(a)(15) of the Internal Revenue Code

We welcome the opportunity to respond to this document and hereby provide comments in relation to the proposed regulations relating to Sections 45V and 48(a)(15) of the Internal Revenue Code. We also welcome the US Government's efforts to accelerate a clean energy transition and recognise the critical role that the Inflation Reduction Act and supporting legislation are playing both in addressing climate change and driving innovation for a cleaner future.

We fully support the objective of 45V in supporting adoption clean hydrogen project development, reducing emissions and decarbonising the economy – in our view, the proposals represent an effective means of doing so. We welcome the additional support the proposals create for the hydrogen sector; however, we strongly urge that the proposals account for the fact that new pathways to produce hydrogen at scale will soon be commercially available.

HiiROC's Thermal Plasma Electrolysis (TPE) process offers one such route to hydrogen production at point of use which combines the low carbon dioxide footprint of water electrolysis with the affordability of steam methane reforming. TPE does this by stripping the carbon from low-weight hydrocarbon feedstocks, capturing the carbon as an inert solid, and producing low-carbon hydrogen fuel (with no CO2 emissions created by the process itself). TPE differs from methane pyrolysis in that it does not require a catalyst, it occupies a relatively small footprint, and in both the high speed and continuous nature of the reaction.

1. About HiiROC (www.hiiroc.com)

HiiROC, a UK-based company, is developing its Thermal Plasma Electrolysis (TPE) process to produce low-cost, low-CO2 hydrogen, at a comparable cost to steam methane reforming but without emissions from production and using only one-fifth of the electricity required by water electrolysis.

HiiROC's proprietary technology uses plasma torches to convert gaseous hydrocarbon feedstocks (such as biomethane/ renewable natural gas, flare and industrial waste gases, propane, and natural gas) into low carbon hydrogen and solid, high-quality carbon black. The latter co-product is stable and could simply be disposed of, but it also has existing and emerging end-use applications, ranging from tyres, inks and coatings, to building materials and soil enhancement. Using HiiROC's TPE process, hydrogen can be produced where it is needed, utilising existing energy infrastructure, and reducing hydrogen storage and transportation costs.

Our technology is rapidly approaching full commercial deployment, bringing with it the potential to unlock step-change growth in the hydrogen economy around the world. The United States is a priority market for us, given the demand for clean hydrogen and clean carbon black, the concentration of hard-to-decarbonise industry sectors, and the abundance of natural gas. HiiROC USA was incorporated in Delaware in 2023 and we are in the process of building an in-country team to service growing demand from US customers.

2. Why are we responding to these proposals?

At HiiROC we are committed to delivering the potential for TPE to decarbonise economic activity, diversify production pathways for low-carbon hydrogen and enable the global energy transition that will be required to counter anthropogenic climate change.

Responding to these proposals represents a critical pathway for us to keep US policymakers and regulators abreast of technological advances that we believe will enable delivery of low carbon hydrogen at greater scale and at lower cost than existing alternatives. We wish to highlight that low-carbon hydrogen can be produced without the generation of process CO2 emissions, by splitting hydrocarbon feedstocks into hydrogen and solid carbon, and that outputting solid carbon in this way should be treated as 'pre-combustion' carbon capture that is equivalent to the 'post-combustion' capture of gaseous CO2.

We hope that our thoughts will be helpful and would welcome the opportunity to discuss them further.

3. General comments on the proposed regulations

Addition of new pathways to GREET model: we believe that having a clear and robust methodology for emissions modelling is vital in ensuring public confidence that low carbon hydrogen is genuinely low carbon in its nature.

We note that the latest published version of the GREET model, ***45VH2-GREET 2023***, includes eight hydrogen production pathways for which lifecycle emissions have been modelled. We welcome the transparency which GREET provides in relation to the methodology for calculating the carbon intensity of hydrogen production by such different methods. However, we are aware of a range of novel technologies rapidly approaching commercial deployment, all based on the principle of decomposing methane or other complex hydrocarbons into the constituent parts of hydrogen and solid carbon.

With this in mind, we urge that further production pathways for low carbon hydrogen should be added to the published GREET model as soon as possible. We believe that these novel technologies have multiple advantages over traditional hydrogen production methods. We would argue that diversifying the range of hydrogen production technologies eligible for 45V support offers the prospect of reaching the aims of the IRA and delivering a price-competitive low carbon hydrogen market in the US sooner and/or at lower cost.

We would welcome the opportunity to work with the DOE and the Argonne National Laboratory to ensure that our TPE process is suitably modelled under the GREET methodology.

We have engaged in a similar process with the UK government, and we note that the UK's Low Carbon Hydrogen Standard (LCHS) has recently been amended to include a group of novel technologies, including our own TPE process.[1]

Recognition of the equivalency between solid carbon output and CCS: we have noted above the technological advances that we believe will enable delivery of low carbon hydrogen at greater scale and at lower cost than existing alternatives. We wish to highlight that low-carbon hydrogen can be produced through TPE without the generation of process CO_2 emissions, by separating hydrocarbon feedstocks into hydrogen and solid carbon, and that outputting solid carbon in this way should be treated as equivalent to the capture of gaseous CO_2.

- Carbon capture is inherently part of HiiROC's TPE process – the carbon content of the hydrocarbon feedstock is collected as solid, inert carbon. At no point in the process is CO_2 formed, and the effective capture rate is therefore 100 percent; for this reason, we wish to see the definition of CCS extended, such that it does not require CO_2 to be formed and then captured to qualify, and the outputting of solid carbon explicitly recognised as equivalent to CCS.
- Renewable natural gas (RNG) can also be used as a feedstock for the TPE process. Coupling this renewable feedstock with CCS, in the form of outputting solid carbon, presents the opportunity to deliver negative CO_2e emissions, which we believe will be an extremely valuable tool in countering anthropogenic climate change.

For these reasons, we strongly urge that the output of solid carbon when producing hydrogen from hydrocarbons should be recognised as fully equivalent to CCS as a means of mitigating emissions of gaseous CO_2.

There is one set of circumstances where we believe this approach should be altered. This is when the solid carbon produced by the TPE process is valorised as a valuable co-product. The solid carbon created as a co-product is equivalent to carbon black, for which there is an existing market. Carbon black has historically been made by the highly emissive oil furnace production method. Therefore, where HiiROC's solid carbon is sold to existing markets for carbon black, displacing volumes made by the oil furnace method, we believe it would be appropriate to recognise this within the calculation of the overall carbon intensity of the TPE process. In other words, when the solid carbon is sold, it would be appropriate to emission-account for this by employing the Displacement Method, which is used for the existing 45V GREET pathways.

Use of counterfactuals: the proposed regulations mention the use of counterfactuals on multiple occasions and in general we are supportive of the adoption of this approach in calculating the carbon intensity of hydrogen production. We would like to highlight a specific instance where we see genuine value in adopting the counterfactual approach:

- *Feedstocks*: both flare gas (i.e. natural gas associated with oil production which is combusted – flared – or simply vented to the atmosphere at the point of extraction, rather than being processed for onward use) and industrial waste gases (which are often also be flared or vented to the atmosphere) can be used as feedstocks for TPE. We believe it would be appropriate, subject to satisfactory demonstration of that alternative fate, to recognise the carbon dioxide

[1] https://www.gov.uk/government/publications/uk-low-carbon-hydrogen-standard-emissions-reporting-and-sustainability-criteria: UK Low Carbon Hydrogen Standard, version 3 – Appendix A, A.18 – A.26. The current treatment of Solid Carbon Sequestration is covered in the accompanying Data Annex, DA.53 – DA.55.

equivalent emissions avoided when this is done when calculating the emissions intensity associated with hydrogen production using such feedstock.

Maximising the availability of low carbon electricity: we believe that low carbon electricity represents a scarce resource and that this will continue to be the case for much of the period out to 2050 and the targeted Net Zero. One of the key roles for low carbon electricity should be as a critical enabler of the production of low carbon hydrogen, which will be required in significant volumes if decarbonisation of the economy and a successful energy transition are to be achieved. For this reason, while we support the principles of incrementality, temporal matching and deliverability, we believe that the Treasury Department and the IRS should be supportive of measures that expand the availability of low carbon electricity, at least in the short- to medium-term. This drives our thinking on the issues raised in relation to 'Avoided Retirements Approach' and 'Zero or Minimal Induced Grid Emissions Through Modelling or Other Evidence'.

Maximising the emissions reduction potential of biomethane/renewable natural gas: similarly, we believe that biomethane/renewable natural gas represents an extremely scarce resource. We appreciate the treatment proposed for Renewable Natural Gas (RNG) and Fugitive Sources of Methane is intended to be logically consistent with, but not identical to the incrementality, temporal matching and deliverability requirements for low carbon electricity.
However, we believe the proposal to stipulate that RNG used during the hydrogen production process must originate from the first productive use of the relevant methane if it is to receive an emissions value which recognises that it is renewable in nature, may be overly restrictive. Using RNG as a feedstock and capturing the carbon content as solid carbon through the TPE process presents the opportunity to deliver negative CO_2e emissions, which we contend will be an extremely valuable tool in countering anthropogenic climate change. For this reason, we expect there could be benefit in relaxing the 'first productive use' condition, if the new use of the RNG delivers overall lower net emissions than its original fate.

Support for a nascent market: while there is increasing recognition of the significant role that low carbon hydrogen will need to play in decarbonising the economy and delivering the energy transition, the low carbon hydrogen market in the US remains in its infancy.

We believe that this has three specific implications.

Firstly, the over-arching regulatory approach should aim to keep things as simple as possible. Otherwise, there is a very real risk that the burden placed on smaller companies will stifle innovation and prevent, or at least delay, the emergence of a price-competitive marketplace for low carbon hydrogen, with multiple buyers and sellers.

Secondly, it may be appropriate to phase in requirements (for example, in relation to temporal matching) gradually, with review of the impacts on market development and whether the underlying aims of IRA are being met, before proceeding to the next stage.

Thirdly, to enable the development of a price-competitive market for low carbon hydrogen as soon as possible, the there is a real need for clarity and consistency within the methodology used to determine the carbon intensity of hydrogen production. An example of where this may be missing is an apparent discrepancy between the respective guidance for the Clean Hydrogen Production Standard and for 45VH2-GREET 2023. The CHPS guidance is based on a functional unit of 1 kilogram of hydrogen at 99% purity and 3 megapascals (MPa) pressure. Should the actual output of hydrogen differ from this quality threshold, the Standard says that adjustments will be made to the lifecycle analysis using GREET.

However, the GREET guidelines[2] state that the model uses a functional unit of one kilogram (kg) of 100% hydrogen at a pressure of 300 psia (i.e. 20 bar) and will adjust the well-to-gate GHG emissions to meet this differing quality threshold. The existence of two differing quality thresholds will create confusion which could otherwise be avoided.

Electing to treat a clean hydrogen production facility as energy property for purposes of the Section 48 credit: we support the proposals to allow a taxpayer to make an irrevocable choice to claim the section 48 credit in lieu of the section 45V credit for hydrogen production. Our rationale is that projects may end up having significantly different characteristics and will therefore derive the most benefit from support in different ways. Depending on the relative importance of capex and opex, projects may be better suited to support from the 48 credit or from the 45V credit. Given the nascency of the market mentioned above, we see real benefit to market participants from the Treasury Department and the IRS providing flexibility in this regard.

[2] Guidelines to Determine Well-to-Gate Greenhouse Gas (GHG) Emissions of Hydrogen Production Pathways using 45VH2-GREET 2023, December 2023

4. Responses to specific requests for comments

Please note that we have not attempted to provide comments on topics where we do not believe we are well placed to do so.

	Section	Page #	Reference Text	HiiROC Comments
1	Explanation of Provisions.V.C.2.a	89229	The Treasury Department and the IRS request comments on whether the electricity generated by such a facility should be considered incremental under circumstances such as if an existing fossil fuel electricity-generating facility after the addition of CCS (after upgrade), had a COD that is no more than 36 months before the relevant hydrogen production facility was placed in service.	Yes, we believe that this would be appropriate. This is because a new source of low carbon electricity is being added to the grid. While the generation capacity itself might not be considered incremental, what is important here is that incremental low carbon capacity is being placed in service and should be recognised as such. Given the early stage of development of the hydrogen industry in the US and elsewhere, we support measures which encourage the availability of low carbon electricity - and hence facilitate the earlier development of a functioning marketplace for hydrogen.

	Section	Page #	Reference Text	HiiROC Comments
2	Explanation of Provisions.V.C.2.a	89230	whether and how to provide alternative approaches to identifying circumstances in which there is minimal risk of significant induced grid emissions for certain existing electricity generating facilities.	Yes, we believe that exploring alternative approaches here would be appropriate. Given the early stage of development of the hydrogen industry in the US and elsewhere, we support measures which encourage the availability of low carbon electricity - and hence facilitate the earlier development of a functioning marketplace for hydrogen. We agree that there will be circumstances where the diversion of existing minimal emissions power generation to hydrogen production will not result in significant induced GHG emissions. There will be periods where excess minimal emissions power generation will have to be curtailed due to the grid constraints and/or lack of electricity storage capacity. Finding a way to allow that excess generation to be harnessed is a sensible route forward; enabling excess generation, which would otherwise be curtailed, to produce hydrogen should be encouraged. One caveat we would add regarding alternative approaches is that these need to be kept as simple as possible. Otherwise, there is a real risk that smaller players will be unable to take advantage of them, delaying the emergence of a price-competitive market for hydrogen.

	Section	Page #	Reference Text	HiiROC Comments
3	Explanation of Provisions.V.C.2.a	89230	The Treasury Department and the IRS are considering providing alternative circumstances under which an EAC may be deemed to satisfy the incrementality requirement. Requesting comments on these specific circumstances as described in part V.C.2.a.i through iii of this Explanation of Provisions.	Yes, we agree with the suggestion to provide alternative circumstances under which an EAC may be deemed to satisfy the incrementality requirement. Given the early stage of development of the hydrogen industry in the US and elsewhere, we support measures which encourage the availability of low carbon electricity - and hence facilitate the earlier development of a functioning marketplace for hydrogen. Again, we would add the caveat that any measures adopted need to be kept as simple as possible. Otherwise, there is a real risk that smaller players will be unable to take advantage of them, delaying the emergence of a price-competitive market for hydrogen.
4	Explanation of Provisions.V.C.2.a.i	89230	Whether to recognize an avoided retirements approach that would treat EACs from an existing electricity generating facility as satisfying the incrementality requirement if the facility is likely to avoid retirement because of its relationship with a hydrogen production facility	Yes, we agree with this approach. Given the early stage of development of the hydrogen industry in the US and elsewhere, we support measures which encourage the availability of low carbon electricity - and hence facilitate the earlier development of a functioning marketplace for hydrogen. In the case of avoided retirements, we would argue that this should count as incremental since the grid will be connected to minimal emission generation capacity which would otherwise not be there. We recognise that proving capacity would otherwise have retired is not easy, but we think that the principle of incrementality is met if this can be proven satisfactorily.

	Section	Page #	Reference Text	HiiROC Comments
5	Explanation of Provisions.V.C.2.a.ii	89231	comments on whether to provide an opportunity to demonstrate zero or minimal induced grid emissions through modeling or other evidence under specific circumstances. A demonstrated or modeled minimal-emission approach could treat electricity produced by certain existing electricity generating facilities under certain circumstances as satisfying the incrementality requirement if it is demonstrated that such sources and circumstances would not give rise to significant induced grid emissions. Such a showing could be based on modeling or potentially be deemed to be made in certain circumstances based on regional grid characteristics, state policy, or facility history.	Yes, we believe that providing such an opportunity would be appropriate. Given the early stage of development of the hydrogen industry in the US and elsewhere, we support measures which encourage the availability of low carbon electricity - and hence facilitate the earlier development of a functioning marketplace for hydrogen. We agree that there will be circumstances where the diversion of existing minimal emissions power generation to hydrogen production will not result in significant induced GHG emissions. There will be periods where excess minimal emissions power generation will have to be curtailed due to the grid constraints and/or lack of electricity storage capacity. Finding a way to allow that excess generation to be harnessed is a sensible route forward; enabling excess generation, which would otherwise be curtailed, to produce hydrogen should be encouraged. One caveat we would add regarding such an approach is that it needs to be kept as simple as possible. Otherwise, there is a real risk that smaller players will be unable to take advantage of it, delaying the emergence of a price-competitive market for hydrogen.

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6	Explanation of Provisions.V.C.2.a.iii	89232	comments on this five percent-allowance approach, including the merits of this approach compared to the targeted pathways described, particularly with respect to balancing administrative feasibility and burden with accuracy of identifying circumstances with a low risk of induced grid emissions.	Given the early stage of development of the hydrogen industry in the US and elsewhere, we support measures which encourage the availability of low carbon electricity - and hence facilitate the earlier development of a functioning marketplace for hydrogen. We agree that there will be circumstances where the diversion of existing minimal emissions power generation to hydrogen production will not result in significant induced GHG emissions. There will be periods where excess minimal emissions power generation will have to be curtailed due to the grid constraints and/or lack of electricity storage capacity. Finding a way to allow that excess generation to be harnessed is a sensible route forward; enabling excess generation, which would otherwise be curtailed, to produce hydrogen should be encouraged. In this case, our concern would be that the five-percent allowance might not adequately represent the volume of instances where there is a low risk of induced grid emissions. We understand in many other geographies that the likelihood of periods where renewable electricity must be curtailed or is otherwise constrained from meeting load is expected to rise. However, we also recognise that an allowance-based approach does have potential advantages in terms of ease of operation. Overall, modelling or similar approaches would be better able to reflect the true instances of there being a low risk of induced grid emissions than an allowance. However, we would welcome further analysis on this issue.

	Section	Page #	Reference Text	HiiROC Comments
7	Explanation of Provisions.V.C.2.a.iii	89232	comments on whether 5 percent is the appropriate magnitude for an allowance. In particular, as noted earlier, data show that curtailment rates have increased in recent years, and NREL's Cambium model predicts additional increases going forward.	We are concerned that five percent may not be the appropriate magnitude for such an allowance. We understand in many other geographies that the likelihood of periods where renewable electricity must be curtailed or is otherwise constrained from meeting load is expected to rise. We see no compelling reason why this would not also be the case in the United States. For this reason, we are concerned that any percentage set for an allowance might rapidly become out of date and that, in any case, five percent may not be an appropriate magnitude for an allowance to start with. Overall, modelling or similar approaches would be better able to reflect the true instances of there being a low risk of induced grid emissions than an allowance. However, we would welcome further analysis on this issue.

	Section	Page #	Reference Text	HiiROC Comments
8	Explanation of Provisions.V.C.2.a.iii	89232	Comments on whether a higher amount, such as up to 10 percent, would be appropriate, either in general or in certain cases or circumstances.	We agree that there will be circumstances where the diversion of existing minimal emissions power generation to hydrogen production will not result in significant induced GHG emissions. There will be periods where excess minimal emissions power generation will have to be curtailed due to the grid constraints and/or lack of electricity storage capacity. Finding a way to allow that excess generation to be harnessed is a sensible route forward; enabling excess generation which would otherwise be curtailed to produce hydrogen should be encouraged wherever possible. We understand in many other geographies that the likelihood of periods where renewable electricity must be curtailed or is otherwise constrained from meeting load is expected to rise. We see no compelling reason why this would not also be the case in the United States. For this reason, we are concerned that any percentage set for an allowance might rapidly become out of date and that, in any case, five percent may not be an appropriate magnitude for an allowance to start with. Overall, modelling or similar approaches would be better able to reflect the true instances of there being a low risk of induced grid emissions than an allowance. However, we would welcome further analysis on this issue.

	Section	Page #	Reference Text	HiiROC Comments
9	Explanation of Provisions.V.C.2.a.iii	89232	comments on: (i) how a five-percent allowance should be tracked, allocated, and administered and how feasible it is for EAC tracking systems to incorporate data on such an allowance; (ii) whether the five percent should apply to all existing minimal-emitting electricity generators in all locations or a subset and for what reasons; (iii) whether such an allowance should be assessed at the individual plant level or across an operator's fleet within the same deliverability region; and (iv) any other administrability considerations.	Overall, modelling or similar approaches would be better able to reflect the true instances of there being a low risk of induced grid emissions than an allowance. However, we would welcome further analysis on this issue.
10	Explanation of Provisions.V.C.2.a.iii	89232	comments on how eligibility for the approach may be reliably verified by an unrelated party and administered by the IRS.	We support the introduction of a strong Monitoring, Reporting and Verification regime as we believe this is critical for engendering public confidence in 45V and its application. In this context we believe that reporting by an unrelated party, with right of audit being retained by the relevant government departments, is a necessary condition.
11	Explanation of Provisions.V.C.2.b	89233	comments on the appropriate duration of this transition rule to hourly matching, including specific data regarding current industry practices, the predicted timelines for development of hourly tracking mechanisms, and the predicted timeline for market development for hourly EACs.	While the transition rule appears reasonable from a 2024 standpoint, our view is that it should be reviewed carefully prior to changing in 2028 and a pragmatic approach adopted at that point, depending on the development of the hydrogen market. Government will then be in a position to decide whether the aims of IRA are being met and whether the planned transition should be delayed or otherwise altered in some way.

	Section	Page #	Reference Text	HiiROC Comments
12	Explanation of Provisions.V.C.2.c	89233	comments on whether there are additional ways to establish deliverability, such as circumstances indicating that electricity is actually deliverable from an electricity generating facility to a hydrogen production facility, even if the two are not located in the same region or if the clean electricity generator is located outside of the United States.	We understand the rationale for and support the existing default approach, whereby deliverability is assumed always to be achievable intra-region. There may be other instances where deliverability is achievable, and we would support the introduction of ways to recognise those instances. However, we would apply the caveat that any evidence requirements to demonstrate deliverability should be kept as simple as possible. Otherwise, there is a risk that smaller players will be unable to take advantage, potentially delaying the emergence of a price-competitive market for hydrogen.
13	Explanation of Provisions.VI.C	89234	comments on whether there are additional safeguards that the regulations could adopt to prevent this or similar types of abusive section 45V credit claims, including section 45V credit claims arising if such circular arrangements are coordinated among multiple parties.	We support the implementation of a strong Monitoring, Reporting and Verification regime to underpin public confidence in the 45V and its application. We agree that this should include all proper safeguards to prevent abusive claims for 45V support.
14	Explanation of Provisions.VI.G	89235	comment on this definition of “qualified verifier,” including on whether additional accreditations that demonstrate sufficient expertise for verification of lifecycle analysis for the section 45V credit should be included.	We support the introduction of a strong Monitoring, Reporting and Verification regime as we believe this is critical for engendering public confidence in 45V and its application. In this context the role the "qualified verifier" needs to be sufficiently qualified to retain the trust of all relevant stakeholders.

	Section	Page #	Reference Text	HiiROC Comments
15	Explanation of Provisions.VIII.A	89236	comments on this proposed rule and whether there are any challenges to using the lifecycle GHG emissions rate achieved in the taxable year in which the section 48(a)(15) election is made to determine the facility's energy percentage for purposes of calculating the section 48 credit amount.	We believe the additional flexibility that this rule brings for projects to be supported in the way that best meets their individual requirements is welcome. In terms of the lifecycle GHG emissions rate that is used as reference for the rule, we believe there is a case for allowing the rate that is achieved in a later year to determine the facility's energy percentage. This is because we can foresee cases where the lifecycle GHG emissions rate in the first year of production may be worse than that achieved after a period of further operation, due to unlocking increased process efficiencies or adopting more advanced solutions. This might mean, for example, using the lifecycle emissions rate achieved in the second full year of operation as a better reflection of the hydrogen production plant's actual performance.

	Section	Page #	Reference Text	HiiROC Comments
16	Explanation of Provisions.IX	89238	"The Treasury Department and the IRS anticipate requiring that for purposes of the section 45V credit, for biogas or biogas-based RNG to receive an emissions value consistent with that gas (and not standard natural gas), the RNG used during the hydrogen production process must originate from the first productive use of the relevant methane. For any specific source of biogas, productive use is generally defined as any valuable application of biogas (including to provide heat or cooling, generate electricity, or upgraded to RNG), and specifically excludes venting to the atmosphere or capture and flaring. The Treasury Department and the IRS further propose to define "first productive use" of the relevant methane as the time when a producer of that gas first begins using or selling it for productive use in the same taxable year as (or after) the relevant hydrogen production facility was placed in service. The implication of this proposal is that biogas from any source that had been productively used in a taxable year prior to taxable year in which the relevant hydrogen production facility was placed in service would not receive an emission value consistent with biogas-based RNG but would instead receive a value consistent with natural gas in the determination of the emissions value for that specific hydrogen production pathway. This proposal would limit emissions associated with the diversion of biogas or RNG from other pre-existing productive uses."	We believe that the proposal to stipulate that biogas and RNG used during the hydrogen production process must originate from the first productive use of the relevant methane, if it is to receive an emissions value which recognises that it is renewable in nature, may be overly restrictive. Using RNG as a feedstock and capturing the carbon content as solid carbon through the TPE process presents the opportunity to deliver negative CO_2e emissions, which we contend will be an extremely valuable tool in countering anthropogenic climate change. For this reason, we feel there could be benefit in relaxing the 'first productive use' condition, so long as the new use of the RNG delivers overall lower net emissions than its original fate.

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17	Explanation of Provisions.IX	89239	comment on these and other potential conditions. Any fugitive sources of methane would be treated in the same fashion as described above for RNG.	Fugitive methane should be treated in the same fashion as RNG, whereby the counterfactual fate is evaluated as part of the life cycle assessment, thus proving its use in hydrogen production is beneficial for the climate at a system level.
18	Explanation of Provisions.IX	89239	comment on the appropriate lifecycle analysis considerations associated with specific fugitive methane sources, such as counterfactual scenarios, to account for direct and significant indirect emissions, and also the manner in which to assess methane from these sources if the current practice is flaring.	We are supportive of counterfactual scenarios, where it can be sufficiently evidenced that the alternative fate has been avoided by diverting the fugitive methane into hydrogen production.
19	Explanation of Provisions.IX.(2)	89239	(2) What conditions for the use of biogas and RNG would ensure that emissions accounting for purposes of the section 45V credit reflects and reduces the risk of indirect emissions effects from hydrogen production using biogas and RNG? How can taxpayers verify that they have met these requirements?	A counterfactual approach should be used to prove the use of biogas and RNG in hydrogen production reduces the risk of indirect emissions, by taking into account the alternative fate, and the emissions associated with replacing this fate. The process needs to be robust but not overly complicated, such that the environmental impacts can be verified.
20	Explanation of Provisions.IX.(5)	89239	(5) What are the emissions associated with different methods of transporting RNG or fugitive methane to hydrogen producers (for example, vehicular transport, pipeline)?	We believe it should be possible to use a book and claim scheme for RNG, enabling pipeline injection at one location and ability to claim use of biomethane at another. An important distinction with HiiROC's TPE technology is that it can work both at the source and at point of use. With respect to fugitive methane, we believe hydrogen production should be at the source to ensure traceability. In addition, for both RNG and fugitive methane, operating at source will minimise the risk of methane leakages during transportation, therefore different emission should be associated with production in these instances.

	Section	Page #	Reference Text	HiiROC Comments
21	Explanation of Provisions.IX.(6)	89239	(6) How can the section 45V regulations reflect and mitigate indirect emissions effects from the diversion of biogas or RNG or fugitive methane from potential future productive uses? What other new uses of biogas or RNG or fugitive methane could be affected in the future if more gas from new capture and productive use of methane from these sources is used in the hydrogen production process?	As per our earlier comments, we believe in any instance, when taking a system expansion approach to consider the counterfactual use for these feedstocks (whether existing or new), the best use of the feedstock can be determined. Technologies such as TPE offer the unique opportunity to create negative emissions through the sequestration of solid biogenic carbon.
22	Explanation of Provisions.IX.(9)	89239	(9) Are geographic or temporal deliverability requirements needed to reflect and reduce the risk of indirect emissions effects from biogas and RNG or fugitive methane use in the hydrogen production process? If so, what should these requirements be and are electronic tracking systems able to capture these details?	TPE can operate at the point-of-use, enabling direct physical connection and avoiding the need for hydrogen storage and transportation, thus geographic and temporal deliverability would be met. This should be a requirement for use of fugitive methane as a feedstock, due to concerns on traceability otherwise. However, we believe a book and claim mechanism should be implemented for biogas and RNG, to ensure producers are not limited to what they are physically able to access and enable the feedstock to be utilised in the best way, at a system level. Environmental attributes would be a critical component of any book and claim system.

	Section	Page #	Reference Text	HiiROC Comments
23	Explanation of Provisions.IX.(10)	89239	(10) How should variation in methane leakage across the existing natural gas pipeline system be taken into account in estimating the emissions from the transportation of RNG or fugitive methane or establishing rules for RNG or fugitive methane use? How should methane leakage rates be estimated based on factors such as the location where RNG or fugitive methane is injected and withdrawn, the distance between the locations where RNG or fugitive methane is injected and withdrawn, season of year, age of pipelines, or other factors? Are data or analysis available to support this?	We believe DOE should estimate/model this and provide default values to use for leakage, based on best available data. This should be revised periodically to reflect improvements in the energy system. Where physical connection to the feedstock can be proven, it may be possible to overwrite default values, should sufficient evidence be provided to prove the leakage rates differ from the default.
24	Explanation of Provisions.IX.(11)	89240	(11) What counterfactual assumptions and data should be used to assess the lifecycle GHG emissions of hydrogen production pathways that rely on RNG? Is venting an appropriate counterfactual assumption for some pathways? If not, what other factors should be considered?	We believe the DOE should provide counterfactual assumptions and data to be used for RNG pathways, to avoid risks of greenwashing. However, should the hydrogen producer have data and evidence of the counterfactual use, for example from the RNG supplier, this should always be used in the first instance, in preference to a market/average assumption provided by DOE. Venting may be appropriate in some instances but is unlikely to be the primary counterfactual, due to the adverse effects RNG venting has on the climate.
25	Explanation of Provisions.IX.(12)	89240	(12) What criteria should be used in assessing biogas and RNG-based PERs? What practices should be put in place to reduce the risk of unintended consequences (for example, gaming)? Should conservative default parameters and counterfactuals be used unless proven otherwise by a third party?	The inclusion of counterfactuals for the feedstock should sufficiently reduce the risk of unintended consequences. Should the RNG or biogas originate from primary crops/purpose grown crops, DOE could consider the inclusion of Land Use Change. Default parameters should be based on best available data.

	Section	Page #	Reference Text	HiiROC Comments
26	Special Analyses.III	89241	comments on both the number of entities affected and the economic impact on small entities.	We would argue for all approaches adopted to be kept as simple as is consistent with achieving the aims of IRA 45V. Otherwise, there is a very real risk that smaller entities will be unable to take advantage of the support offered, due to the level of administrative burden involved. This in turn would risk delaying the emergence of a price-competitive market for hydrogen, to the detriment of end users.
27	Special Analyses.III.D	89242	Comments are requested on the requirements in the proposed regulations, including specifically whether there are less burdensome alternatives that do not increase the risk of duplication, fraud, or improper payments under section 45V.	We strongly support the adoption of any alternative approaches which are less burdensome, without increasing the risk of duplication, fraud, or improper claims for support under section 45V.

	Section	Page #	Reference Text	HiiROC Comments
28	Explanation of Provisions.V.B.3	89226	The Treasury Department and the IRS seek comments on appropriate indicators of project readiness that should be in place before an applicant requests an emissions value to ensure that requests correspond to hydrogen production facilities with significant commercial interest, and standards against which these indicators could be measured	We have a major concern about the proposed requirement here for a FEED study or similar to have been completed for a proposed hydrogen production facility before an application can be made for a Provisional Emissions Rate to be determined. This is likely to be too high a threshold. Our fear is that end users are not going to be willing to commit to, and potentially fund, a FEED study without having a strong indication of how the emissions intensity of the hydrogen production facility is going to be assessed. This is because they will lack clarity on whether the proposed hydrogen production facility would be entitled to the production tax credit support available under section 45V and this is likely to be a key factor in deciding whether to advance a project to FEED. We appreciate the need to discourage frivolous applications for a Provisional Emissions Rate but believe that requiring a FEED study is too high a threshold and, for this reason, we would strongly support the acceptance of alternative indicators of project readiness. These indicators could include: evidence that a technology is being successfully deployed in other geographies; evidence that a technology has been recognised as a low carbon hydrogen production pathway in other jurisdictions; representations from interested parties (e.g. producer, technology provider, offtaker) that they are looking to progress a particular project; evidence that physical preparations for a project have been made, such as the purchase of a suitable site; contracts signed with relevant project suppliers (feedstock, other inputs, technology); management accounts showing the DEVEX already committed to a project.

	Section	Page #	Reference Text	HiiROC Comments
29	Explanation of Provisions.II.C.	89224	Instead of defining "most recent GREET model" to be the latest version of 45VH2–GREET that is publicly available on the first day of the taxpayer's taxable year, an alternative approach would be for the Secretary to determine that the latest version of 45VH2–GREET is an appropriate "successor model," as provided by section 45V(c)(1)(B), for the purpose of administering the section 45V tax credit. The Treasury Department and the IRS request comment on these approaches.	We have no preference between these suggestions. However, it is critical that the guidance makes clear which version is to be used.
30	Explanation of Provisions.V.A.	89225	The Treasury Department and the IRS seek comment on the readiness of verification mechanisms that could be utilized for certain background data in 45VH2–GREET if it were reverted to foreground data in future releases. For example, the upstream methane loss rate is background data in 45VH2–GREET, and the Treasury Department and the IRS seek comment on conditions, if any, under which the methane loss rate may in future releases become foreground data (such as certificates that verifiably demonstrate different methane loss rates for natural gas feedstocks, sometimes described as responsibly sourced natural gas).	We would support the inclusion of additional functionality which would allow the upstream methane loss rate to be calculated as foreground data, at the discretion of the user. This would allow users to account for specific sources of methane in their lifecycle emission calculations, in instances where their actual methane loss rate is significantly lower than the background data assumption. While evidence relating to these calculations might need to be bespoke originally, over time we would anticipate that appropriate verification mechanisms (for example, certification schemes) would emerge upon which the Treasury Department and the IRS could rely.
31	Explanation of Provisions.V.A.	89225	he Treasury Department and the IRS seek comments on this approach, including whether alternative co-product accounting methods, such as physical allocation (for example, energy allocation or mass allocation) or allocation based on other characteristics, would better ensure well-to-gate carbon intensity of hydrogen production is accurately represented.	We support allocating emissions to co-products using the system-expansion method. Should this not be considered suitable, then physical allocation would also be a valid option. If so, we note that mass allocation is likely to be easier for all parties to work with as the industry already tends to report process volumes on a mass basis.

	Section	Page #	Reference Text	HiiROC Comments
32	Explanation of Provisions.V.C	89227	For example, one megawatt-hour of electricity used to produce hydrogen would need to be matched with one megawatt-hour of qualifying EACs. The Treasury Department and the IRS seek comments on whether a different treatment would be more appropriate to account for transmission and distribution line losses.	In principle we agree with the notion that electricity transmission & distribution line losses should be accounted for in the lifecycle GHG emissions analysis, as this provides a more accurate representation of how hydrogen production using electricity input is impacting emissions. We recognise that accounting for T&D losses introduces the requirement for an additional calculation, but we believe that this can appropriately be based upon estimation and the use of an agreed background factor. The most important consideration is for consistency in treatment across all different production pathways.
33	Explanation of Provisions.V.C.2	89228	the Treasury Department and the IRS are requesting comments on whether and under what circumstances electricity generated by an existing electricity generating facility (that is, with a less recent COD) that is dedicated to hydrogen production may be treated as satisfying the incrementality requirement	We believe it would be appropriate to recognise an existing electricity generating facility as satisfying the incrementality requirement in situations where its operating performance has materially changed since COD but within the three years prior to the hydrogen production facility opening. The circumstances should be such that incremental minimal emission capacity has been brought into service and a new stream of low carbon electricity is being added to the grid. Given the early stage of development of the hydrogen industry in the US and elsewhere, we support measures which encourage the availability of low carbon electricity - and hence facilitate the earlier development of a functioning marketplace for hydrogen.

	Section	Page #	Reference Text	HiiROC Comments
34	Explanation of Provisions.V.C.2	89229	The Treasury Department and the IRS request comment on what information is needed to document and verify GHG emissions related to minimal-emitting electricity generation that is purchased and used for hydrogen production for purposes of claiming the section 45V credit.	We believe that the information requirements should be similar to those captured by the Renewable Electricity Guarantees of Origin certificates used in other geographies.
35	Explanation of Provisions.V.C.2	89229	The Treasury Department and the IRS also request comment on the extent and manner in which incrementality, temporal matching, and deliverability should be applied in accounting for existing or new electricity generation from biomass or fossil feedstock. These comments may inform future versions of 45VH2–GREET.	We support the principles of incrementality, temporal matching and deliverability. In general, we believe that the treatment of other types of generation capacity should be consistent with that applied to renewable electricity capacity. However, as noted elsewhere in our response, we believe that the Treasury Department and the IRS may need to be supportive of measures that expand the availability of low carbon electricity, at least in the short- to medium-term, to encourage the development of a price-competitive market for low carbon hydrogen.
36	Explanation of Provisions.V.C.2.a	89229	Comment is also requested on the related question of whether, depending on its carbon dioxide capture rate, it would be appropriate to treat such a facility as a new source of minimal-emitting generation on the grid that would not be associated with induced grid emissions.	Yes, we believe that this would be appropriate. This is because a new source of low carbon electricity is being added to the grid. While the generation capacity itself might not be considered incremental, what is important here is that incremental low carbon capacity is being placed in service and should be recognised as such. Given the early stage of development of the hydrogen industry in the US and elsewhere, we support measures which encourage the availability of low carbon electricity - and hence facilitate the earlier development of a functioning marketplace for hydrogen.

Once again, on behalf of HiiROC, I would like to thank you for the opportunity to comment on these important issues.

Please do not hesitate to get in touch should any of the matters raised above require clarification; we would welcome the opportunity to engage further with the Treasury Department and the IRS on the topics upon which we have touched.

Yours sincerely,

Duncan Coneybeare
Strategy, Policy and Markets Director
HiiROC

Email: d.coneybeare@hiiroc.com